National Water Conditions

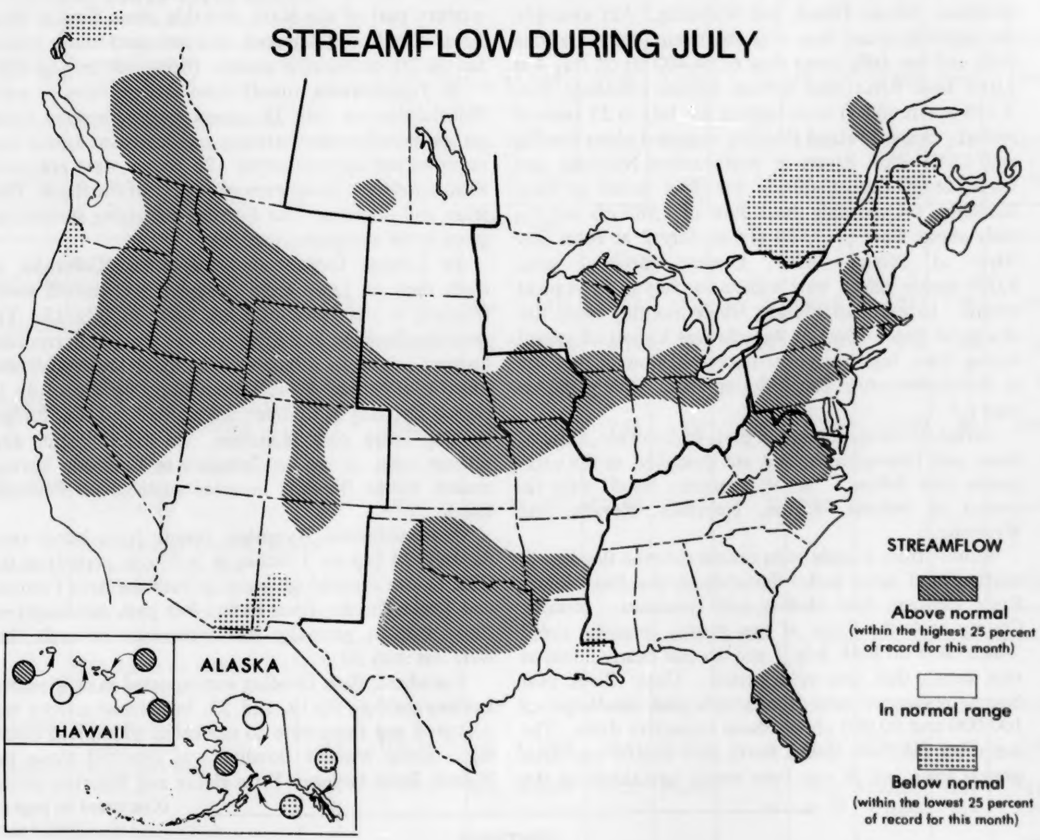
(Formerly the Water Resources Review)

UNITED STATES
Department of the Interior
Geological Survey

CANADA
Department of the Environment
Water Resources Branch

JULY 1982

STREAMFLOW DURING JULY



Streamflow generally decreased seasonally and was in the normal range or above that range in most of the United States and southern Canada during July. Flood peak discharges on several streams in Iowa, Illinois, and Pennsylvania were highest of record and equaled or exceeded the 100-year flood at several locations.

Reservoir storage was near or above average except in parts of Colorado, New Hampshire, New Mexico, Quebec, Texas, and Wyoming.

STREAMFLOW CONDITIONS DURING JULY 1982

Streamflow generally decreased seasonally and was in the normal range or above that range in most of the United States and southern Canada during July, as a result of high carryover flow from June, augmented by runoff from intense rains in parts of several States during July. Monthly mean flows remained in the above-normal range in parts of most middle Atlantic States, southern Florida, and in several States from Illinois westward to a large area in and adjacent to Idaho.

Monthly mean flows were highest of record for July in parts of Kansas and Oregon, and were the second highest for period of record in parts of Hawaii, Idaho, Montana, Rhode Island, and Wyoming. For example, the monthly mean flow of 3,360 cubic feet per second (cfs) and the daily mean flow of 14,400 cfs on July 4 at Little Blue River near Barnes, Kansas (drainage area, 3,324 square miles) were highest for July in 25 years of record. Some lowland flooding occurred along the Big and Little Blue Rivers in southeastern Nebraska and northeastern Kansas during the first week in July. Similarly, the monthly mean flow of 1,980 cfs and the daily mean flow of 3,530 cfs on July 2 at John Day River at Service Creek, Oregon (drainage area, 5,090 square miles), were highest for July in 56 years of record. In southern Florida, where monthly mean discharge of Peace River at Arcadia was highest of record during June, high carryover flow held flow at that site in the above-normal range during July. (See graph on page 6.)

Severe flooding occurred in parts of Colorado, Illinois, Iowa, and Pennsylvania, and are described in the paragraphs that follow. Lower frequency floods were reported in Indiana, Kansas, Nebraska, Nevada, and Wyoming.

Runoff from intense rains caused extreme flooding in south-central **Iowa** and tributaries to the Des Moines River between Des Moines and Ottumwa. Monroe County took the brunt of two storms, receiving about 7-inch rains on both July 3 and 16 and nearly 2 feet of rain during that two-week period. Cedar Creek near Bussey responded with floods with peak discharges of 100,000 and 80,000 cfs on those respective dates. The storm on the 16th spread north into central and east-central Iowa and at one time nearly two-thirds of the State was under flash flood warnings. The accompanying table and map on page 3 shows peak stage and discharge data at selected gaging stations in Iowa, Illinois, and Pennsylvania.

In western **Illinois**, runoff from intense rains on July 7, 8 caused severe flooding in the Henderson Creek, Pope Creek, and the Edwards River basins. On July 22, runoff from heavy rains in the Chicago area produced maximum flows of record on several urban-area streams. Selected data on stages, discharges, recurrence intervals, and locations for those gaging stations are given in the accompanying map and table. In the northwestern part of the State, monthly mean flow of Rock River near Joslin increased, and remained above median for the 7th consecutive month. (See graph on page 6.)

In **Pennsylvania**, runoff from intense rains in north Philadelphia on July 28 caused record-breaking floods on several urban-area streams. At least two deaths were reported and approximately 120 people were evacuated from apartment complexes as a result of the flood. Peak stage and discharge data for selected gaging stations are given in the accompanying table.

In Larimer County in north-central **Colorado**, an earth dam on Lawn Lake collapsed and caused severe flooding in the town of Estes Park on July 15. The resulting flood on Fall River was the greatest in recorded history, caused an estimated $21 million in damages, and killed four people. Runoff from heavy rains on July 27 caused flooding in Boulder and washed out four bridges on Dry Creek near Montrose. On the following day, intense rains of up to 3 inches in Colorado Springs caused minor flooding in areas adjacent to Fountain Creek.

In northeastern **Wyoming**, runoff from heavy rains on July 24 (up to 3 inches in a 2-hour period) in the Gillette area caused high water in both the Belle Fourche and Little Powder River basins, but peak discharges on those streams generally had recurrence intervals that were less than 20 years.

Elsewhere, flash flooding was reported in west-central **Indiana** on July 8, 19, and 23, but storm activity was scattered and there were no reports of widespread flooding. Some lowland flooding was reported along the Wabash River between Terra Haute and Riverton during

(Continued on page 6.)

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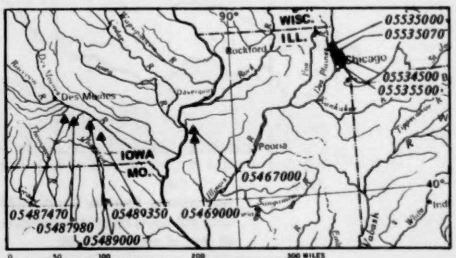
STAGES AND DISCHARGES FOR THE FLOODS OF JULY 1982 AT SELECTED SITES IN PENNSYLVANIA, ILLINOIS, AND IOWA

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge		Recurrence interval (years)
									Cfs	Cfs per square mile	
	PHILADELPHIA, PENNSYLVANIA										
	DELAWARE RIVER BASIN										
01465790	Byberry Creek at Chalfont Road	5.34	1965–78	Aug. 28, 1971	12.46	1,930	July 28	15.4	3,000	562	>100
01465798	Poquess Creek at Grant Avenue	21.4	1965–70, 1974–	Aug. 28, 1971	13.05	7,380	28	15.35	11,000	514	>100
01467048	Pennypack Creek at Lower Rhawn Street Bridge ...	49.8	1965–70, 1974–	Aug. 28, 1971	[a]10.25	6,630	28	13.15	11,600	233	>100
01467050	Wooden Bridge Run......	3.35	1965–	Aug. 27, 1967	12.2	1,860	28	17.19	2,800	836	75
	ILLINOIS										
	ILLINOIS RIVER BASIN										
05534500	North Branch Chicago River at Deerfield	19.7	1952–	Mar. 5, 1976	[b]9.72	550	July 22	10.88	743	38	100
05535000	Skokie River at Lake Forest	13.0	1951–	Aug. 23, 1972	[c]6.79	367	22	8.35	400	31	40
05535070	Skokie River near Highland Park	21.1	1967–	Aug. 26, 1972	8.10	570	22	8.27	580	27	20
05535500	West Fork N. Branch Chicago River at Northbrook ...	11.5	1952–	July 13, 1957	9.65	930	22	9.54	1,040	90	>100
	POPE CREEK BASIN										
05467000	Pope Creek near Keithsburg	183	1934–	Apr. 22, 1973	[d]27.88	8,900	8	28.44	(e)	.....	100
	HENDERSON CREEK BASIN										
05469000	Henderson Creek near Oquawka	432	1934–	Apr. 25, 1950	28.17	16,500	8	30.88	(e)	.....	>100
	IOWA										
	DES MOINES RIVER BASIN										
05487470	South River near Ackworth	460	1940–	June 5, 1947	[f]24.60	34,000	July 16	31.89	25,000	54	100
05487980	White Breast Creek near Dallas...........	342	1962–	July 5, 1981	26.61	12,300	16	33.37	[g]20,000	59	100
05489000	Cedar Creek near Bussey	374	1947–	May 9, 1950	27.50	29,300	3	34.61	[g]100,000	267	>100
							16	33.20	[g]80,000	214	>100
05489350	South Avery Creek near Blakesburg	33.1	1965–	June 9, 1967	88.95	15,000	3	90.20	[g]22,000	665	>100

[a]Maximum gage height, 10.54 ft on Aug. 27, 1967.
[b]Maximum gage height, 10.34 ft on June 20, 1972.
[c]Maximum gage height, 7.36 ft on June 20, 1972.
[d]Maximum gage height, 28.0 ft on Feb. 21, 1937.
[e]Discharge not determined.
[f]Site and datum then in use.
[g]Estimated discharge.

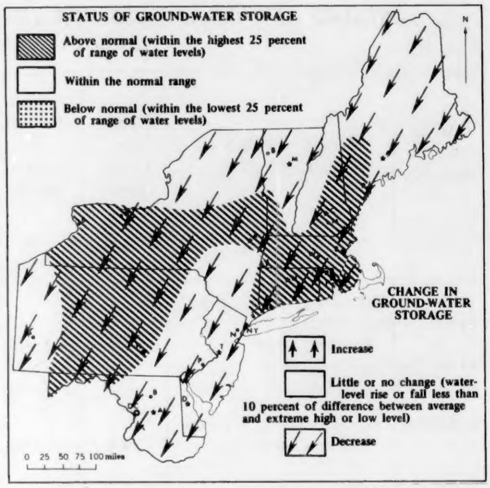
[Location of stream-gaging stations in Illinois and Iowa, described in table of peak stages and discharges.]



GROUND-WATER CONDITIONS DURING JULY 1982

In the northeastern States, ground-water levels generally declined seasonally. Levels near end of month were about average in much of central New England, and in large areas of New York and Pennsylvania, at least partly a carryover from unusually high levels in June. (See map.) In a few key observation wells in New York and New England, levels were the highest for the end of July in the past 20–40 years.

In the southeastern States, ground-water levels generally declined in Virginia and in most of West Virginia, and generally rose in Florida. Trends were mixed in Arkansas and Georgia and the Gulf States of Louisiana, Mississippi, and Alabama. Water levels were above average in Kentucky, North Carolina, and Alabama, mostly below average in West Virginia and Virginia, and near or below average in Arkansas, Louisiana, and Florida. A new low level for July was reached in the key well at Memphis, Tennessee, and a new alltime low level occurred in the index well in terrace gravel near Alexandria, Louisiana.

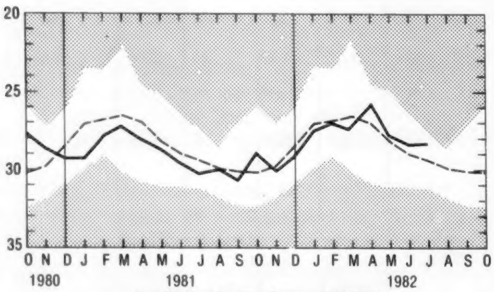


Map shows ground-water storage near end of July and change in ground-water storage from end of June to end of July.

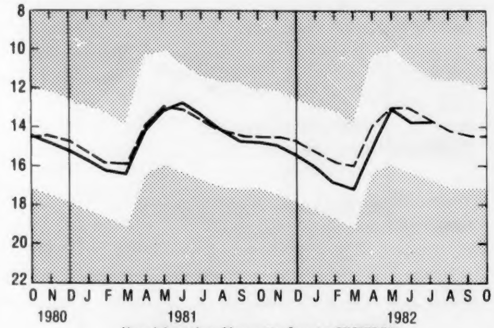
MONTH-END GROUND-WATER LEVELS IN KEY WELLS

UNSHADED AREA INDICATES RANGE BETWEEN HIGHEST AND LOWEST RECORD FOR THE MONTH
DASHED LINE INDICATES AVERAGE OF MONTHLY LEVELS, IN PREVIOUS YEARS
HEAVY LINE INDICATES LEVEL FOR CURRENT PERIOD

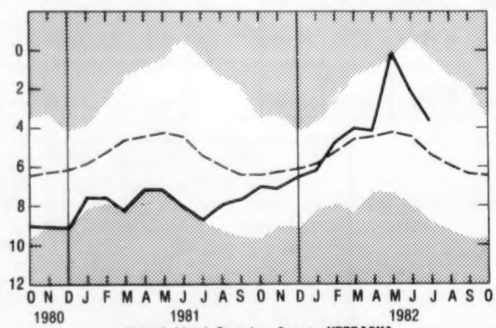
WATER LEVEL—FEET BELOW LAND-SURFACE DATUM



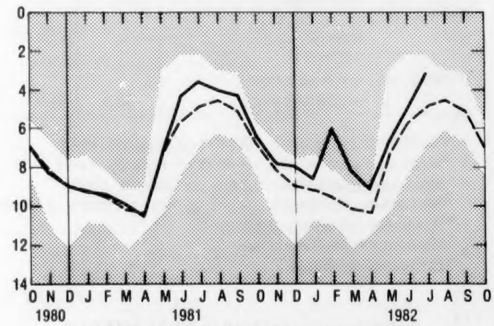
Near Centreville, Bibb County, **ALABAMA**
Copper Ridge and Chepultepec Dolomite
29 years of record, 1952–80



Near Ishpeming, Marquette County, **MICHIGAN**
Sand and gravel of Pleistocene age
20 years of record, 1961–80



Near Ashland, Saunders County, **NEBRASKA**
Sand and gravel deposits of Pleistocene age
48 years of record, 1933–80



Near Boise (Meridian), Ada County, southwestern **IDAHO**
Quaternary sand and gravel
47 years of record, 1934–80

Among the Great Lakes States, including also Iowa, ground-water levels declined in Minnesota, Michigan, and Indiana, and in much of Wisconsin except in the northeastern part. Trends were mixed in Iowa, and the level in the key well in Illinois rose. Levels were above average in Iowa, near average in Wisconsin, and mixed with respect to average in Minnesota, Michigan, and Ohio. A new high ground-water level for July was recorded in Iowa, and a new low for July occurred in the key well in northeastern Ohio.

Among the western States, ground-water levels declined in southern California, Arizona, Kansas, and Texas, and in most wells in Nebraska. Trends were mixed in other reporting States. Levels were above average in Washington and Nebraska, below average in Montana and Arizona, and mixed with respect to average elsewhere. A new high ground-water level for July occurred in Nevada, and new lows for July were reported in Idaho and Utah. New alltime lows were reached in Idaho, Arizona, and Texas.

WATER LEVELS IN KEY OBSERVATION WELLS IN SOME REPRESENTATIVE AQUIFERS IN THE CONTERMINOUS UNITED STATES

Aquifer and location	Current water level in feet below land-surface datum	Departure from average in feet	Net change in water level in feet since:		Year records began	Remarks
			Last month	Last year		
Glacial drift at Hanska, south-central Minnesota	-6.00	+0.31	-1.05	+1.02	1943	
Glacial drift at Roscommon in north-central part of Southern Peninsula, Michigan	-4.46	+0.21	-0.25	+0.09	1935	
Glacial drift at Marion, Iowa	-1.74	+3.56	+0.85	+3.93	1941	July high.
Glacial drift at Princeton in northwestern Illinois	-6.98	+4.75	+1.19	+3.28	1943	
Petersburg Granite, southeastern Piedmont near Fall Zone, Colonial Heights, Virginia	-15.44	+0.13	-0.24	+0.65	1939	
Glacial outwash sand and gravel, Louisville, Kentucky	-18.22	+7.50	-0.02	-0.57	1946	
500-foot sand aquifer near Memphis, Tennessee (U.S. well no. 2)	-103.73	-15.62	-0.44	-0.40	1941	July low.
Granite in eastern Piedmont Province, Chapel Hill, North Carolina	-40.10	+1.72	+0.75	+4.18	1931	
Sparta Sand in Pine Bluff industrial area, Arkansas	-229.95	-26.57	+5.45	+5.10	1958	
Copper Ridge and Chepultepec Dolomites, Centreville, Alabama	-28.2	+1.2	+0.1	+2.1	1952	
Limestone aquifer on Cockspur Island, Savannah area, Georgia	-24.40	-5.94	0	+2.50	1956	
Sand and gravel in Puget Trough, Tacoma, Washington	-104.58	+6.78	+0.93	+11.53	1952	
Pleistocene glacial outwash gravel, North Pole, northern Idaho (U.S. well no. 3)	-457.9	+2.0	-0.8	+7.9	1929	
Snake River Group: southwestern Snake River Plain aquifer, at Eden, Idaho	-125.8	-9.1	+1.8	-1.7	1957	
Terrace gravel at Missoula, Montana	-13.30	-1.19	-4.20	+0.90	1960	
Alluvial sand and gravel, Platte River Valley, Nebraska (U.S. well no. 6)	-3.67	+1.87	-1.55	+5.08	1935	
Alluvial valley fill in Steptoe Valley, Nevada	-11.29	+2.23	-0.62	+0.31	1950	July high.
Ogallala Formation, Kansas Agricultural Experiment Station at Colby in the High Plains of northwestern Kansas	-124.50	-7.61	-0.03	+1.79	1947	
Alluvium and Paso Robles, clay, sand, and gravel, Santa Maria Valley, California	-152.67	-7.02	-15.59	-36.37	1957	
Valley fill, Elfrida area, Douglas, Arizona (U.S. well no. 15)	-115.6	-37.39	-3.1	-2.1	1951	Alltime low.
Berrendo-Smith well in San Andres Limestone, Roswell artesian basin of Pecos Valley, New Mexico (U.S. well no. 1-A)	-67.68	+0.80	-1.29	-2.93	1966	
Hueco bolson, El Paso area, Texas	-263.23	-16.33	-0.80	-2.41	1965	Alltime low.
Evangeline aquifer, Houston area, Texas	-325.40	-28.37	-2.06	-5.92	1965	

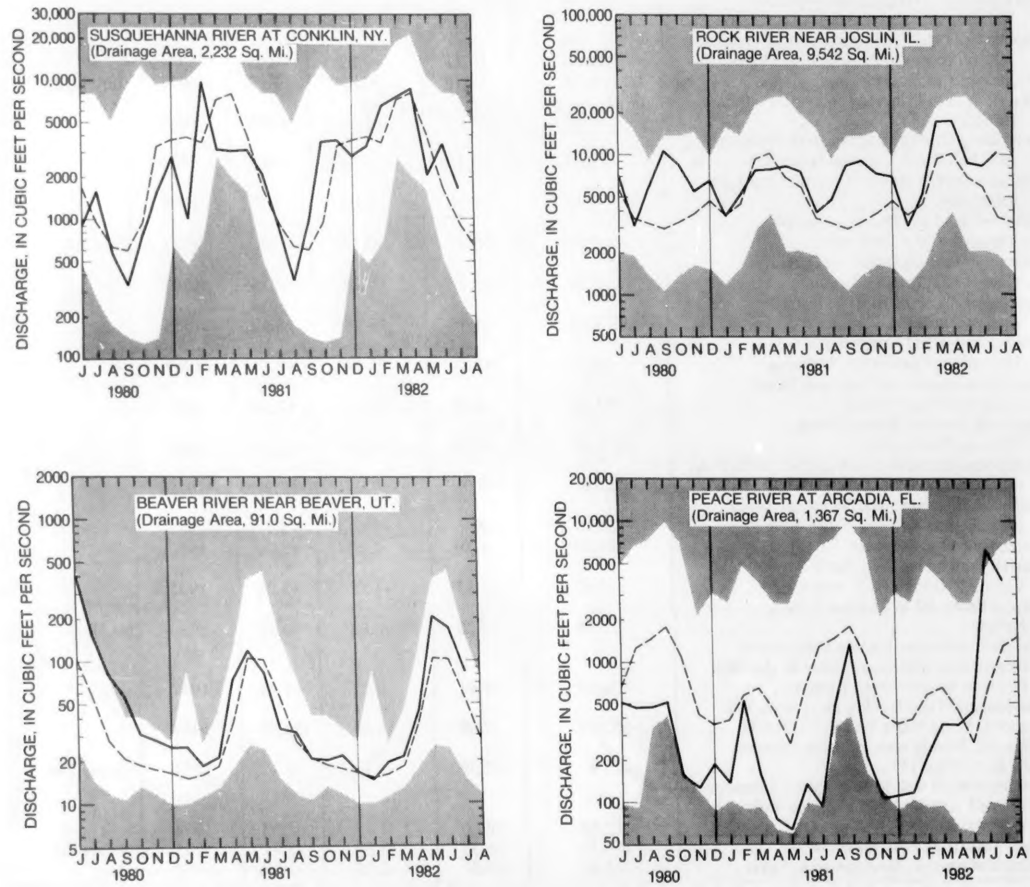
(Continued from page 2.)
this period. In northwestern **Nevada**, some local flooding occurred near month's end and caused damage to croplands in the Yerrington area.

By contrast, flows remained in the below-normal range in parts of New Brunswick, Quebec, Alaska, Arizona, Lousiana, Maine, and Oregon, and decreased into that range in parts of British Columbia and New Mexico. In the coastal area of south-central Alaska, for example, the monthly mean discharge of 4,524 cfs and the daily mean flow of 2,330 cfs at Kenai River at Cooper Landing (drainage area, 634 square miles) were lowest for July in 35 years of record.

The above-normal trend in streamflow was also evident in the combined flow of three large Rivers—Mississippi, St. Lawrence, and Columbia—which averaged 1,229,700 cfs during July, 29 percent above median, and in the above-normal range for the second consecutive month. Because these three large rivers account for about half the runoff in the conterminous 48 States, their combined flow provides a quick check on the status of the Nation's water resources.

SURFACE WATER – MONTHLY MEAN DISCHARGE IN KEY STREAMS

Unshaded area indicates range between highest and lowest record for the month. Dashed line indicates median of monthly values for reference period, 1951–80. Heavy line indicates mean for current period.



PERENNIAL-STREAMFLOW CHARACTERISTICS RELATED TO CHANNEL GEOMETRY AND SEDIMENT IN MISSOURI RIVER BASIN

The abstract and illustrations below are from the report, *Perennial-streamflow characteristics related to channel geometry and sediment in Missouri River basin,* by W. R. Osterkamp and E. R. Hedman, U.S. Geological Survey Professional Paper 1242, 37 pages, 1982. This report may be purchased for $4.75 from Eastern Distribution Branch, USGS, 604 S. Pickett St., Alexandria, VA 22304 (check or money order payable to U.S. Geological Survey); or from Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (payable to Superintendent of Documents).

ABSTRACT

Geometry, channel-sediment, and discharge data were collected and compiled from 252 streamflow-gaging stations in the Missouri River basin. (See figure 1.) The stations, with several exceptions, have at least 20 years of streamflow records and represent the complete ranges of hydrologic and geologic conditions found in the basin. The data were analyzed by computer to yield simple and multiple power-function equations relating various discharge characteristics to variables of channel geometry and bed and bank material. (See table 1.) The equations provide discharge as the dependent variable for the purpose of making estimates of discharge characteristics at ungaged sites. (See table 2.)

Results show that channel width is best related to variables of discharge, but that significant improvement, or reduction of the standard errors of estimate, can be achieved by considering channel-sediment properties, channel gradient, and discharge variability. (See figure 2.) The channel-material variables do not have uniform effects on width-discharge relations and, therefore, are considered as sediment-data groups, or stream types, rather than as terms in multiple power-function equations.

Relative to streamflow, narrowest channels occur when streams of steady discharge transport sufficient silt and clay to form stable, cohesive banks but have a small bed-material load of sand and coarser sizes. Stable channels also are associated with relatively large channel gradients, relatively large channel roughness, and armoring of bed and bank by coarse particle sizes. The widest, most unstable channels are ones that apparently transport a large bed-material load of sand sizes. The downstream rates of change of width with discharge reflect these trends, indicating that a given bed-material load necessitates a minimum width for movement of tractive material.

Comparisons of standard errors of estimate given here with similar results from regional studies are variable. It is assumed, however, that a benefit of this study is that the use of the equations is not limited to the Missouri River basin. Besides the principal utility of estimating discharge characteristics of ungaged streams, the equations given here can be used for the design of artificial channels and can be used as a basis of predicting channel changes resulting from upstream alterations of the basin or channel.

Table 1.—*Descriptions of data groups based on channel material*

[Channel types used for identification purposes are not intended to be descriptive of the stream types. SC_{bd} is silt-clay content of bed material in percent, SC_{bk} is the higher silt clay content, in percent, of the two bank-material samples, and d_{50} is the diameter size of particles, in millimeters, for which equal parts of the sample are of greater or smaller weight]

Channel types	No. of sampling sites	Channel-sediment characteristics		
High silt-clay bed	15	$SC_{bd}=61\text{-}100$		$d_{50}<2.0$
Medium silt-clay bed	17	$SC_{bd}=31\text{-}60$		$d_{50}<2.0$
Low silt-clay bed	30	$SC_{bd}=11\text{-}30$		$d_{50}<2.0$
Sand bed, silt banks	33	$SC_{bd}=1\text{-}10$	$SC_{bk}=70\text{-}100$	$d_{50}<2.0$
Sand bed, sand banks	96	$SC_{bd}=1\text{-}10$	$SC_{bk}=1\text{-}69$	$d_{50}<2.0$
Gravel bed	42			$d_{50}=2.0\text{-}64$
Cobble bed	19			$d_{50}>64$

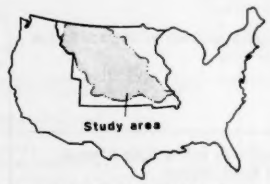


Figure 1.—Location of study area.

Table 2.—*Width-discharge relations for channels of specified sediment properties*

[SC_{bd} is silt-clay percentage of bed material; SC_{bk} is silt-clay percentage of bank material; and d_{50} is median particle size of bed material, in millimeters. $\bar{Q}$ is mean discharge, in cubic meters per second; Q_2 through Q_{100} are flood discharges, in cubic meters per second, of recurrence intervals 2 through 100 years; and W is active-channel width, in meters]

Channel type (table 1)	Equation	Standard error of estimate, SE (percent)	Coefficient of correlation, R	Level of significance (from *F*-ratio for width)
High silt-	$\bar{Q}=0.031W^{2.12}$	35	0.98	0.001
clay bed	$Q_2=2.0W^{1.86}$	52	.94	.001
($SC_{bd}=$	$Q_5=5.3W^{1.77}$	54	.93	.001
61.100;	$Q_{10}=8.1W^{1.74}$	57	.92	.001
$d_{50}<2.0$)	$Q_{25}=13W^{1.71}$	62	.90	.001
	$Q_{50}=16W^{1.71}$	65	.89	.001
	$Q_{100}=19W^{1.74}$	69	.88	.001

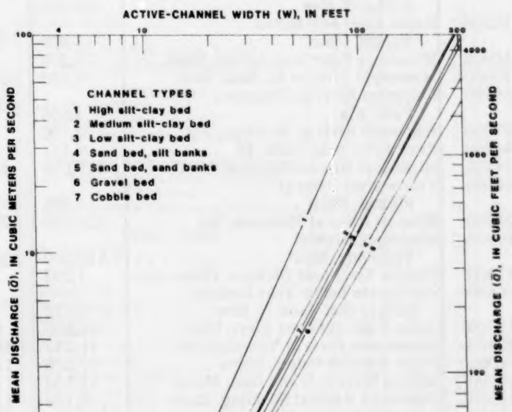


Figure 2.—Structural relations between active-channel width and mean discharge for stream channels of specified sediment characteristics.

Provisional data; subject to revision

FLOW OF LARGE RIVERS DURING JULY 1982

Station number	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1980 (cubic feet per second)	July 1982: Monthly mean discharge (cubic feet per second)	July 1982: Percent of median monthly discharge, 1951–80	July 1982: Change in discharge from pervious month (percent)	Discharge near end of month: Cubic feet per second	Discharge near end of month: Million gallons per day	Discharge near end of month: Date
01014000	St. John River below Fish River at Fort Kent, Maine	5,690	9,647	2,822	60	-51	2,200	1,420	31
01318500	Hudson River at Hadley, N.Y	1,664	2,909	1,040	100	-60	400	260	31
01357500	Mohawk River at Cohoes, N.Y	3,456	5,734	2,350	125	-64	1,000	650	31
01463500	Delaware River at Trenton, N.J	6,780	11,750	7,340	152	-46	4,220	2,727	27
01570500	Susquehanna River at Harrisburg, Pa	24,100	34,530	17,600	148	-70	8,320	5,377	31
01646500	Potomac River near Washington, D.C.	11,560	[1]11,490	6,370	158	-72	5,510	3,561	31
02105500	Cape Fear River at William O. Huske Lock near Tarheel, N.C.	4,810	5,005	3,100	158	-78	11,000	7,100	30
02131000	Pee Dee River at Peedee, S.C	8,830	9,851	6,880	120	-63	5,760	3,722	28
02226000	Altamaha River at Doctortown, Ga	13,600	13,880	8,221	123	-21	9,930	6,417	30
02320500	Suwannee River at Branford, Fla	7,880	6,987	5,280	102	+39	7,860	5,080	31
02358000	Apalachicola River at Chattahoochee, Fla	17,200	22,570	15,600	115	+7	15,000	9,700	31
02467000	Tombigbee River at Demopolis lock and dam near Coatopa, Ala	15,400	23,300	7,316	116	-54	6,600	4,270	30
02489500	Pearl River near Bogalusa, La	6,630	9,768	2,533	78	+15	2,580	1,667	31
03049500	Allegheny River at Natrona, Pa	11,410	[1]19,480	9,449	157	-67	5,130	3,315	26
03085000	Monongahela River at Braddock, Pa.	7,337	[1]12,510	9,420	233	-23	7,400	4,780	23
03193000	Kanawha River at Kanawha Falls, W. Va	8,367	12,590	6,385	124	-65	3,400	2,200	26
03234500	Scioto River at Higby, Ohio	5,131	4,547	1,644	97	-52	1,160	749	30
03294500	Ohio River at Louisville, Ky[2]	91,170	116,000	50,710	103	-62	13,600	8,790	27
03377500	Wabash River at Mount Carmel, Ill	28,635	27,220	23,894	154	-40	14,000	9,000	31
03469000	French Broad River below Douglas Dam, Tenn	4,543	6,798	4,115	99	-29	......	......	...
04084500	Fox River at Rapide Croche Dam, near Wrightstown, Wis[2]	6,150	4,163	3,034	126	+17	4,019	2,597	24
04264331	St. Lawrence River at Cornwall, Ontario–near Massena, N.Y[3]	299,000	242,700	291,000	106	0	285,000	184,200	31
050115	St. Maurice River at Grand Mere, Quebec	16,300	25,150	8,700	43	-58	12,700	8,210	30
05082500	Red River of the North at Grand Forks, N. Dak	30,100	2,551	3,180	119	-3	4,560	2,947	24
05133500	Rainy River at Manitou Rapids, Minn.	19,400	12,830	15,000	91	-36	16,100	10,410	26
05330000	Minnesota River near Jordan, Minn.	16,200	3,402	3,952	94	-42	2,430	1,570	31
05331000	Mississippi River at St. Paul, Minn	36,800	[1]10,610	12,115	92	-40	8,270	5,345	31
05365500	Chippewa River at Chippewa Falls, Wis	5,600	5,100	3,428	108	+7	13,900	8,980	31
05407000	Wisconsin River at Muscoda, Wis	10,300	8,617	6,106	107	-7	15,100	9,760	31
05446500	Rock River near Joslin, Ill	9,551	5,873	10,400	299	+27	10,000	6,500	26
05474500	Mississippi River at Keokuk, Iowa	119,000	62,620	100,800	161	-11	72,600	46,920	31
06214500	Yellowstone River at Billings, Mont	11,796	7,038	27,150	181	-10	16,000	10,300	31
06934500	Missouri River at Hermann, Mo	524,200	79,490	135,200	178	-39	72,800	47,050	31
07289000	Mississippi River at Vicksburg, Miss[4]	1,140,500	576,600	585,300	136	-33	516,000	333,500	26
07331000	Washita River near Dickson, Okla.	7,202	1,368	2,285	549	-68	780	504	31
08276500	Rio Grande below Taos Junction Bridge, near Taos, N. Mex	9,730	725	1,040	318	-46	470	303	31
09315000	Green River at Green River, Utah.	40,600	6,298	7,497	131	-51	3,200	2,070	31
11425500	Sacramento River at Verona, Calif	21,257	18,820	15,100	155	-21	......	......	...
13269000	Snake River at Weiser, Idaho	69,200	18,050	21,432	193	-31	10,600	6,850	28
13317000	Salmon River at White Bird, Idaho	13,550	11,250	33,297	228	-50	16,200	10,470	28
13342500	Clearwater River at Spalding, Idaho	9,570	15,480	15,143	139	-74	9,000	5,800	28
14105700	Columbia River at The Dalles, Oreg[5]	237,000	193,100	353,400	126	-43	221,900	143,420	28
14191000	Willamette River at Salem, Oreg.	7,280	23,510	7,160	129	-41	7,040	4,550	28
15515500	Tanana River at Nenana, Alaska.	25,600	23,460	60,906	104	+10	62,000	40,100	31
8MF005	Fraser River at Hope, British Columbia	83,800	96,290	257,057	134	-16	220,688	142,634	29

[1] Adjusted.
[2] Records furnished by Corps of Engineers.
[3] Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.
[4] Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.
[5] Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF JULY 1982

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	Percent of normal maximum				Normal maximum (acre-feet)[a]
	End of July 1982	End of July 1981	Average for end of July	End of June 1982	
NORTHEAST REGION					
NOVA SCOTIA					
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	64	61	60	77	[b]226,300
QUEBEC					
Allard (P)	81	81	76	87	280,600
Gouin (P)	51	91	69	52	6,954,000
MAINE					
Seven reservoir systems (MP)	79	77	79	91	4,098,000
NEW HAMPSHIRE					
First Connecticut Lake (P)	88	93	89	92	76,450
Lake Francis (FPR)	76	83	87	83	99,310
Lake Winnipesaukee (PR)	94	95	88	102	165,700
VERMONT					
Harriman (P)	81	71	78	86	116,200
Somerset (P)	82	74	82	131	57,390
MASSACHUSETTS					
Cobble Mountain and Borden Brook (MP)	88	79	83	95	77,920
NEW YORK					
Great Sacandaga Lake (FPR)	84	82	82	96	786,700
Indian Lake (FMP)	90	94	90	95	103,300
New York City reservoir system (MW)	94	77	....	98	1,680,000
NEW JERSEY					
Wanaque (M)	96	78	81	101	85,100
PENNSYLVANIA					
Allegheny (FPR)	50	50	44	46	1,180,000
Pymatuning (FMR)	98	95	93	99	188,000
Raystown Lake (FR)	68	67	60	77	761,900
Lake Wallenpaupack (PR)	73	75	73	79	157,800
MARYLAND					
Baltimore municipal system (M)	91	86	91	86	255,800
SOUTHEAST REGION					
NORTH CAROLINA					
Bridgewater (Lake James) (P)	95	88	90	95	288,800
Narrows (Badin Lake) (P)	92	95	97	95	128,900
High Rock Lake (P)	86	83	77	89	234,800
SOUTH CAROLINA					
Lake Murray (P)	92	91	76	96	1,614,000
Lakes Marion and Moultrie (P)	85	83	71	85	1,862,000
SOUTH CAROLINA--GEORGIA					
Clark Hill (FP)	81	50	70	78	1,730,000
GEORGIA					
Burton (PR)	96	99	91	98	104,000
Sinclair (MPR)	88	82	90	88	214,000
Lake Sidney Lanier (FMPR)	61	52	61	62	1,686,000
ALABAMA					
Lake Martin (P)	98	93	90	109	1,373,000
TENNESSEE VALLEY					
Clinch Projects: Norris and Melton Hill Lakes (FPR)	54	49	56	37	2,229,300
Douglas Lake (FPR)	58	60	60	68	1,394,000
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	77	65	76	79	1,012,000
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	63	60	62	70	2,880,000
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	71	67	77	77	1,478,000
WESTERN GREAT LAKES REGION					
WISCONSIN					
Chippewa and Flambeau (PR)	87	90	83	85	365,000
Wisconsin River (21 reservoirs) (PR)	87	86	74	79	399,000
MINNESOTA					
Mississippi River headwater system (FMR)	38	35	38	35	1,640,000
MIDCONTINENT REGION					
NORTH DAKOTA					
Lake Sakakawea (Garrison) (FIPR)	91	78	94	84	22,700,000
SOUTH DAKOTA					
Angostura (I)	89	64	87	95	127,600
Belle Fourche (I)	83	44	55	102	185,200
Lake Francis Case (FIP)	76	76	81	78	4,834,000
Lake Oahe (FIP)	92	69	....	92	22,530,000

Reservoir Principal uses: F–Flood control I–Irrigation M–Municipal P–Power R–Recreation W–Industrial	Percent of normal maximum				Normal maximum (acre-feet)[a]
	End of July 1982	End of July 1981	Average for end of July	End of June 1982	
MIDCONTINENT REGION—Continued					
SOUTH DAKOTA—Continued					
Lake Sharpe (FIP)	99	97	100	98	1,725,000
Lewis and Clarke Lake (FIP)	89	92	94	83	477,000
NEBRASKA					
Lake McConaughy (IP)	78	75	74	85	1,948,000
OKLAHOMA					
Eufaula (FPR)	98	90	87	112	2,378,000
Keystone (FPR)	113	95	95	141	661,000
Tenkiller Ferry (FPR)	104	99	96	119	628,200
Lake Altus (FIMR)	93	26	66	84	133,000
Lake O'The Cherokees (FPR)	93	98	91	107	1,492,000
OKLAHOMA--TEXAS					
Lake Texoma (FMPRW)	99	92	101	132	2,722,000
TEXAS					
Bridgeport (IMW)	100	37	49	103	386,400
Canyon (FMR)	94	101	74	97	385,600
International Amistad (FIMPW)	97	100	74	97	3,497,000
International Falcon (FIMPW)	91	101	69	99	2,668,000
Livingston (IMW)	100	100	84	101	1,788,000
Possum Kingdom (IMPRW)	94	93	99	99	570,200
Red Bluff (PI)	13	17	24	15	307,000
Toledo Bend (P)	94	98	89	96	4,472,000
Twin Buttes (FIM)	49	46	27	49	177,800
Lake Kemp (IMW)	101	68	89	102	268,000
Lake Meredith (FWM)	40	17	38	34	796,900
Lake Travis (FIMPRW)	95	98	78	94	1,144,000
THE WEST					
WASHINGTON					
Ross (PR)	100	100	95	89	1,052,000
Franklin D. Roosevelt Lake (IP)	100	103	100	94	5,022,000
Lake Chelan (PR)	99	100	98	90	676,100
Lake Cushman (PR)	103	102	99	100	359,500
Lake Merwin (P)	105	106	105	103	245,600
IDAHO					
Boise River (4 reservoirs) (FIP)	92	75	76	98	1,235,000
Coeur d'Alene Lake (P)	98	99	82	88	238,500
Pend Oreille Lake (FP)	99	99	95	97	1,561,000
IDAHO--WYOMING					
Upper Snake River (8 reservoirs) (MP)	93	67	71	88	4,401,000
WYOMING					
Boysen (FIP)	101	92	90	78	802,000
Buffalo Bill (IP)	104	94	101	98	421,300
Keyhole (F)	30	27	50	31	190,400
Pathfinder, Seminoe, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	62	54	57	64	3,056,000
COLORADO					
John Martin (FIR)	6	5	17	5	364,400
Taylor Park (IR)	83	68	91	58	106,200
Colorado–Big Thompson project (I)	53	65	72	61	722,600
COLORADO RIVER STORAGE PROJECT					
Lake Powell; Flaming Gorge, Fontenelle, Navajo, and Blue Mesa Reservoirs (IFPR)	92	84	....	89	31,620,000
UTAH--IDAHO					
Bear Lake (IPR)	92	71	67	88	1,421,000
CALIFORNIA					
Folsom (FIP)	94	67	77	96	1,000,000
Hetch Hetchy (MP)	100	88	78	100	360,400
Isabella (FIR)	92	40	41	98	568,100
Pine Flat (FI)	92	49	55	97	1,001,000
Clair Engle Lake (Lewiston) (P)	98	85	84	100	2,438,000
Lake Almanor (P)	105	78	62	109	1,036,000
Lake Berryessa (FIMW)	95	79	81	98	1,600,000
Millerton Lake (FI)	100	51	65	104	503,200
Shasta Lake (FIPR)	94	71	78	100	4,377,000
CALIFORNIA--NEVADA					
Lake Tahoe (IPR)	97	46	69	98	744,600
NEVADA					
Rye Patch (I)	91	55	66	76	194,300
ARIZONA--NEVADA					
Lake Mead and Lake Mohave (FIMP)	85	84	73	86	27,970,000
ARIZONA					
San Carlos (IP)	13	34	15	19	1,073,000
Salt and Verde River system (IMPR)	73	59	41	79	2,073,000
NEW MEXICO					
Conchas (FIR)	60	24	82	45	330,100
Elephant Butte and Caballo (FIPR)	35	36	27	38	2,453,000

[a]1 acre-foot = 0.0436 million cubic feet = 0.326 million gallons = 0.504 cubic feet per second day.
[b]Thousands of kilowatt-hours (the potential electric power that could be generated by the volume of water in storage).

DISSOLVED SOLIDS AND WATER TEMPERATURES FOR JULY AT DOWNSTREAM SITES ON SIX LARGE RIVERS

Station number	Station name	July data of following calendar years	Stream discharge during month	Dissolved-solids concentration during month[a]		Dissolved-solids discharge during month[a]			Water temperature during month[b]		
			Mean (cfs)	Minimum (mg/L)	Maximum (mg/L)	Mean (tons per day)	Minimum (tons per day)	Maximum (tons per day)	Mean, in °C	Mini-mum, in °C	Maxi-mum, in °C
	NORTHEAST										
01463500	Delaware River at	1982	7,344	92	122	2,170	1,350	4,200	26.0	20.0	30.0
	Trenton, N.J.	1945–81	7,113	57	145	....	465	16,700	.....	18.5	33.5
	(Morrisville, Pa.)	(Extreme yr)		(1947)	(1978)		(1965)	(1969)			
			[c]4,822								
04264331	St. Lawrence River at	1982	291,000	166	166	130,000	128,000	134,000	19.0	16.0	22.0
	Cornwall, Ontario, near	1976–81	403,100	165	169	129,000	109,000	158,000	20.0	17.0	22.0
	Massena, N.Y.	(Extreme yr)		(1980–81)	(1981)		(1977)	(1976)			
	median streamflow at		[c]272,800								
	Ogdensburg, N.Y.										
	SOUTHEAST										
07289000	Mississippi River at	1982	585,300	218	268	362,000	320,000	461,000	29.0	27.5	30.0
	Vicksburg, Miss.	1976–81	488,800	200	303	316,000	163,000	633,000	29.5	23.5	34.5
		(Extreme yr)		(1981)	(1978)		(1977)	(1980)			
			[c]421,700								
	WESTERN GREAT LAKES	*REGION*									
03612500	Ohio River at lock and dam	1982	152,000	161	207	....	39,200	107,000	.....	25.5	29.0
	53, near Grand Chain, Ill.	1955–81	158,900	124	276	....	25,000	237,000	.....	16.5	31.0
	(25 miles west of Paducah,	(Extreme yr)		(1965–67	(1968)		(1966)	(1958)			
	Ky.; streamflow station		[c]143,700								
	at Metropolis, Ill.)										
	MIDCONTINENT										
06934500	Missouri River at Hermann,	1982	135,000	269	354	114,000	68,600	167,000	27.0	23.5	30.5
	Mo. (60 miles west of St.	1976–81	90,000	201	494	79,200	44,700	190,000	28.0	22.0	32.0
	Louis, Mo.)	(Extreme yr)		(1981)	(1980)		(1977)	(1981)			
			[c]75,690								
	WEST										
14128910	Columbia River at	1982	283,000	66	79	54,900	40,200	43,000	18.0	16.5	20.0
	Warrendale, Oreg.	1976–81	171,500	66	93	38,700	12,500	65,100	18.5	16.0	21.0
	(streamflow station	(Extreme yr)		(1976)	(1977)		(1977)	(1981)			
	at The Dalles, Oreg.)		[c]279,500								

[a]Dissolved-solids concentrations when not analyzed directly, are calculated on basis of measurements of specific conductance.
[b]To convert °C to °F: $[(1.8 \times °C) + 32] = °F$.
[c]Median of monthly values for 30-year reference period, water years 1951–80, for comparison with data for current month.

NATIONAL WATER CONDITIONS

July 1982

Based on reports from the Canadian and U.S. Field offices; completed August 10, 1982

The National Water Conditions is published monthly. Subscriptions are free on application to the National Water Conditions, U.S. Geological Survey, MS 420, Reston, Virginia 22092.

EXPLANATION OF DATA

Cover map shows generalized pattern of streamflow for the month based on 18 index stream-gaging stations in Canada and 164 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations that are located near the points shown by the arrows.

Streamflow for the current month is compared with flow for the same month in the 30-year reference period, 1951–80. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being *within the normal range*. In the National Water Conditions, the median is obtained by ranking the 30 flows for each month of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median. One-half of the time you would expect the flows for the month to be below the median and one-half of the time to be above the median.

Statements about *ground-water levels* refer to conditions near the end of the month. The water level in each key observation well is compared with average level for the end of the month determined from the entire past record for that well or from a 30-year reference period, 1951–80. *Changes in ground-water levels*, unless described otherwise, are from the end of the previous month to the end of the current month.

Dissolved solids and temperature data for July are given for six stream-sampling sites that are part of the National Stream Quality Accounting Network (NASQAN). Dissolved solids are minerals dissolved in water and usually consist predominantly of silica and ions of calcium, magnesium, sodium, potassium, carbonate, bicarbonate, sulfate, chloride, and nitrate. Dissolved-solids discharge represents the total daily amount of dissolved minerals carried by the stream. Dissolved-solids *concentrations* are generally higher during periods of low streamflow, but the highest dissolved-solids *discharges* occur during periods of high streamflow because the total quantities of water, and therefore total load of dissolved minerals, are so much greater than at time of low flow.

METRIC EQUIVALENTS OF UNITS USED IN THE NATIONAL WATER CONDITIONS

1 foot = 0.3048 meter

1 acre-foot = 1,233 cubic meters

1 million cubic feet = 28,320 cubic meters

1 cubic foot per second =
0.02832 cubic meters per second =
1.699 cubic meters per minute

1 cubic foot per second · day = 2,447 cubic meters

1 mile = 1.609 kilometers

1 square mile = 259 hectares = 2.59 square kilometers

1 million gallons = 3,785 cubic meters =
3.785 million liters

1 million gallons per day = 694.4 gallons per minute =
2.629 cubic meters per minute =
3,785 cubic meters per day

(Round-number conversions, to nearest four significant figures)

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